CLAIMS

What is claimed is:

1. A method for extracting a polymeric contact lens from a mold, the method comprising:

lowering the temperature of the contact lens to a temperature sufficient to reduce adhesion between the lens and the mold to a point where removing the lens will not damage the lens, and

thereafter removing the lens from the mold.

2. The method of claim 1 wherein said step of lowering the temperature of the contact lens comprises substantially reducing the molecular mobility of the contact lens polymer using a cryogenic substance.

3. The method of claim 2 wherein the step of substantially reducing the molecular mobility of the contact lens comprises directly contacting the contact lens with a cryogenic substance.

4. The method of claim 3 wherein the cryogenic substance is selected from the group consisting of liquid nitrogen, liquid helium and solid carbon dioxide.

5. The method of claim 2 wherein the step of substantially reducing the molecular mobility of the contact lens comprises contacting the mold with a cryogenic substance while the lens is in contact therewith.

6. The method of claim 5 wherein the cryogenic substance is selected from the group consisting of liquid nitrogen, liquid helium and solid carbon dioxide.

7. The method of claim 1 wherein the contact lens comprises a siloxane-containing polymer.

8. A method for extracting a silicon containing polymeric contact lens from a mold, the method comprising:

bringing the lens into contact with a cryogenic substance for a time sufficient to lower the temperature of the lens to a temperature sufficient to reduce adhesion between the lens and the mold to a point where removing the lens will not damage the lens,

separating the lens from the mold, and

recovering the lens.

9. A method according to claim 8 wherein the cryogenic substance is selected from the group consisting of liquid nitrogen, liquid helium and solid carbon dioxide.

10. A method according to claim 8 wherein the step of separating the lens from the mold comprises lowering the temperature of the lens to a temperature at which the lens will release from the mold without the application of external force to the lens.

11. A method for extracting a silicon containing polymeric contact lens from a mold, the method comprising:

bringing the mold into contact with a cryogenic substance for a time sufficient to lower the temperature of the lens to a temperature sufficient to reduce adhesion between the lens and the mold to a point where removing the lens will not damage the lens,

separating the lens from the mold, and

recovering the lens.

12. A method according to claim 11 wherein the cryogenic substance is selected from the group consisting of liquid nitrogen, liquid helium and solid carbon dioxide.

13. A method according to claim 11 wherein the step of causing separation of the lens from the mold comprises lowering the temperature of the lens to a temperature at which the lens will release from the mold without the application of external force to the lens.

14. A method for extracting a silicon containing polymeric contact lens from a mold, the method comprising:

orienting a contact lens bearing mold upon a carrier such that the contact lens may fall from the mold;

situating a contact lens collector so as to collect a falling contact lens;

causing the mold to come into intimate contact with a cryogenic substance;

causing separation of the lens from the mold; and

collecting the lens.

15. A method according to claim 14 wherein the step of causing separation of the lens from the mold comprises causing the mold to come into intimate contact with a cryogenic substance for a time sufficient to lower the temperature of the lens to a temperature sufficient to reduce adhesion between the lens and the mold to a point where the lens will automatically separate from the mold and fall to the lens collector.

16. A method according to claim 15 wherein the cryogenic substance is selected from the group consisting of liquid nitrogen, liquid helium and solid carbon dioxide.

17. A method for manufacturing a silicon containing polymeric contact lens from a mold, the method comprising:

bringing two mold halves together to form a lens mold;

filling the mold with an uncured polymer;

curing the polymer in the mold;

separating the mold halves from one another;

bringing the mold half bearing the contact lens into contact with a cryogenic substance for a time sufficient to lower the temperature of the lens to a temperature sufficient to reduce adhesion between the lens and the mold half to a point where removing the lens will not damage the lens;

separating the lens from the mold half, and

recovering the lens.

18. A method according to claim 17 wherein the cryogenic substance is selected from the group consisting of liquid nitrogen, liquid helium and solid carbon dioxide.

19. A method according to claim 18 wherein the step of causing separation of the lens from the mold half comprises bringing the mold half bearing the lens into contact with a cryogenic substance for a time sufficient to lower the temperature of the lens to a temperature sufficient to reduce adhesion between the lens and the mold half to a point where the lens will fall from the mold half when the mold half is oriented above the lens.

20. An apparatus for deblocking and collecting contact lenses formed of hydrophilic polymers that tend to adhere to mold surfaces, said apparatus comprising:

a contact lens mold; and

means for cooling said lens mold to a temperature at which a contact lens on said lens mold will release from said mold without damage to the contact lens.

21. A deblocking apparatus according to claim 20 wherein said cooling means comprises a reservoir in said lens mold for receiving a cryogent therein.

22. A deblocking apparatus according to claim 20 and further comprising a lens collector for receiving a contact lens that has been released from said lens mold.

23. A deblocking apparatus according to claim 22 and further comprising means for aligning said lens mold with said lens collector so that lenses released from said lens mold transfer properly to said lens collector.

24. A deblocking apparatus according to claim 23 wherein said aligning means comprises at least one pair of retaining mechanisms situated parallel and opposite to one another.

25. A deblocking apparatus according to claim 24 wherein said pair of parallel and opposite retaining mechanisms comprises at least two plates, with one of said plates having a lens collector and the other of said plates having a lens mold.

26. A deblocking apparatus according to claim 25 wherein said lens mold plate is situated above said lens collector plate.

27. An apparatus for deblocking and collecting contact lenses, the apparatus comprising:

a top plate having at least one top plate hole for receiving a contact lens mold bearing a contact lens, and

a bottom plate having at least one lens collector for receiving said contact lens, said lens collector being in axial alignment with said top plate hole.

28. An apparatus according to claim 27 wherein said bottom plate further comprises a bottom plate hole with said contact lens collector being removably positioned in said hole.

29. The apparatus of claim 28 wherein said contact lens collector is a generally hemispherical structure having an inner surface and an outer surface, said generally hemispherical structure being oriented with the apex of said generally hemispherical structure extending toward said top plate.

30. A deblocking apparatus according to claim 29 wherein said generally hemispherical structure possesses a plurality of openings that reduce the outer surface area of said generally hemispherical structure.

31. A deblocking apparatus according to claim 30 wherein said generally hemispherical structure is formed from a polymer and snap fits within said bottom plate hole.

32. A deblocking apparatus according to claim 31 wherein the outer surface of said generally hemispherical structure possesses raised protrusions for further reducing the effective outer surface area of said generally hemispherical structure.

33. A deblocking apparatus according to claim 27 wherein said top plate further comprises a structure for securing the positioning of said received contact lens mold.

34. A deblocking apparatus according to claim 33 wherein said securing structure comprises a pair of flexible tabs on said plate opposite from one another along the perimeter of said top plate hole for being urged against the mold when a mold is in said top plate hole to thereby maintain a lens mold in said top plate hole.

35. An apparatus for deblocking and collecting contact lenses, said apparatus comprising:

a top plate and a bottom plate;

said top plate having respective top and bottom surfaces and a plurality of top plate holes for providing fluid communication between said top and bottom top plate surfaces, said top plate holes being of sufficient diameter to receive a front curve contact lens mold; and

said bottom plate having a plurality of contact lens collectors, said contact lens collectors being removably retained within a plurality of bottom plate holes; and

said plates being aligned with said bottom plate holes in axial alignment with said top plate holes.

36. A deblocking apparatus according to claim 35 further comprising at least one spacing device situated between said top plate and said bottom plate.

37. A deblocking apparatus according to claim 35 wherein said top plate further comprises at least one retaining device to secure the positioning of front curve lens molds that are placed in said top plate.

38. A deblocking apparatus according to claim 35 wherein said contact lens collector is a generally disklike structure having an outer diameter and an inner diameter defining a flange, said flange enclosing a generally hemispherical portion extending from said flange to a point intermediate said top plate top surface and said bottom plate.

39. A deblocking apparatus according to claim 38 wherein said generally hemispherical portion possesses an inner surface and an outer surface and a plurality of openings that effectively reduce the outer surface area of said generally hemispherical portion.

40. A deblocking apparatus according to claim 39 wherein said generally hemispherical portion is formed from a polymer and snap fits within said bottom plate hole.

41. A deblocking apparatus according to claim 39 wherein the outer surface of said generally hemispherical portion possesses raised protrusions to further reduce the effective outer surface area of said generally hemispherical portion.

42. An apparatus for deblocking and collecting contact lenses, said apparatus comprising:

a top plate and a bottom plate separated by at least one spacer;

said top plate having respective top and bottom surfaces and a plurality of top plate holes for providing fluid communication between said top and bottom surfaces, said top plate holes being of sufficient diameter to receive a front curve contact lens mold bearing a contact lens; and

said top plate further having a retaining device for securing the positioning of front curve lens molds that are received by said top plate, said retaining device comprising at least two flexible tabs oriented perpendicular to said top plate top surface; and

said bottom plate having a plurality of lens collectors, said lens collectors being generally hemispherical, perforated, polymeric, and oriented such that the apex of said generally hemispherical lens collector extends towards said top plate, said generally

hemispherical lens collector being removably retained within a plurality of bottom plate holes and;

said plates being aligned with said bottom plate holes being in axial alignment with said top plate holes.